MACHINE LEARNING-BASED FAKE JOB RECRUITMENT DETECTION SYSTEM

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ABSTRACT

In order to avoid fraudulent online job postings, we use an automated tool that uses natural language processing (NLP) and classification techniques based on machine learning are suggested on paper. Using the NLP library SpaCy in python we have performed various analyzes such as semantic, syntactic, tokenization of the task profile extracting features and using a machine learning algorithm called Random Forest we have predicted its accuracy to classify a job profile as Real or Fake.

Keywords: Machine Learning, Random Forest Classification, Natural Language Processing, Python, etc

1.INTRODUCTION

Employment scam is one of the most serious issues in the recent history of cybercrime. Many organizations have recently decided to publicize their job openings so that job seekers may find them conveniently and quickly.However, this goal can be a scam for fraudsters because they hire job seekers by taking money from them. Fake job advertisements may be sent to a reputable company for breach of trust. This discovery of fake jobs highlights the importance of developing an automated method for detecting false jobs and disclosing them to the public while preventing job solicitations.

In order to detect fake jobs, a machine learning approach is used, which employs numerous categorization algorithms. The Classification Algorithm isolates the fake job profile from the larger dataset of job advertisements.

We introduced the Random Forest Classification approach of supervised learning with the NLP package SpaCy to handle the problem of detecting fraudulent employment.

2. RELATEDWORK

Email spam identification and fake news detection, according to various research, have gotten a lot of interest in the field of online fraud detection. In the field of online fraud detection, email spam detection and fake news identification have gotten a lot of attention.

2.1 Email SpamDetection-

Lots of unwanted emails, which are part of the Spam emails section, usually arrive in the user's inbox. This can lead to inevitable storage problems and bandwidth usage. To address this issue, Gmail, Yahoo Mail, and Outlook have included spam filters based on Neural Networks.. When dealing with email spam detection problem, content-based filtering, status-based filtering, heuristic-based filtering, memory or sample-based filtering, flexible spam filtering methods are considered.

2.2 Fake NewsDetection-

False news on social media exposes malicious user accounts, echo chamber results. The basic research for the detection of false stories is based on three perspectives - how false stories are written, how false stories spread, how the user is associated with false stories. Features associated with news and social content have been eliminated, and a machine learning model has been built up to detect misleading stories.

3. PROPOSEDMETHODOLOGY

The aim of this research is to discover whether the

work is fraudulent or not.. Identifying and ending these fake job advertisements will help job seekers focus only on official positions. In this context, a set of data from Kaggle is used that provides information about a job that you may or may not suspect. The data set has a schema as shown in Fig. 1.

```
job_id              int64
title               object
location            object
department          object
salary_range        object
company_profile     object
description         object
requirements        object
benefits            object
telecommuting       int64
has_company_logo    int64
has_questions       int64
employment_type     object
required_experience object
required_education  object
industry            object
function            object
fraudulent          int64
```

Fig 1 Schema Structure of the dataset

This dataset contains 17,880 number of job posts.In order to better understand the intended purpose as a basis, a multi-step process is followed to obtain an equal database. Before entering this data into any category, some of the previous processing methods are applied to this database .Missing values, stop-words, irrelevant attribute deletion, and additional space are some of the pre-processing approaches. Fig 2 explain the architecture diagram.
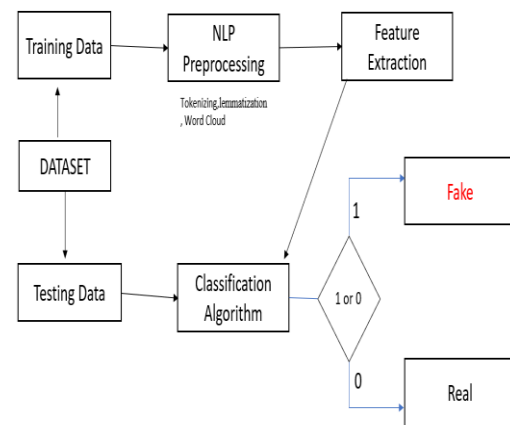

Fig 2 Architecture Diagram

3.1 Data Preprocessing

Pre-data processing involves converting raw data into well-structured data sets for data mining statistics. Raw data is frequently incomplete and formatted inconsistently. The adequacy or inadequacy of data correction has a direct impact on the effectiveness of any data analysis activity.

3.1.1 Data Visualization

Data visualisation is a valuable skill because it allows us to obtain a qualitative knowledge of data. This is useful for studying and learning about the data set, as well as spotting patterns, corrupt data, and outliers.

In terms of bar graphs, pie charts, and other forms of data visualisation, essential relationships can be expressed and demonstrated.Here we show the bar graph of country wise job available Fig 3 and degree wise job available Fig 4
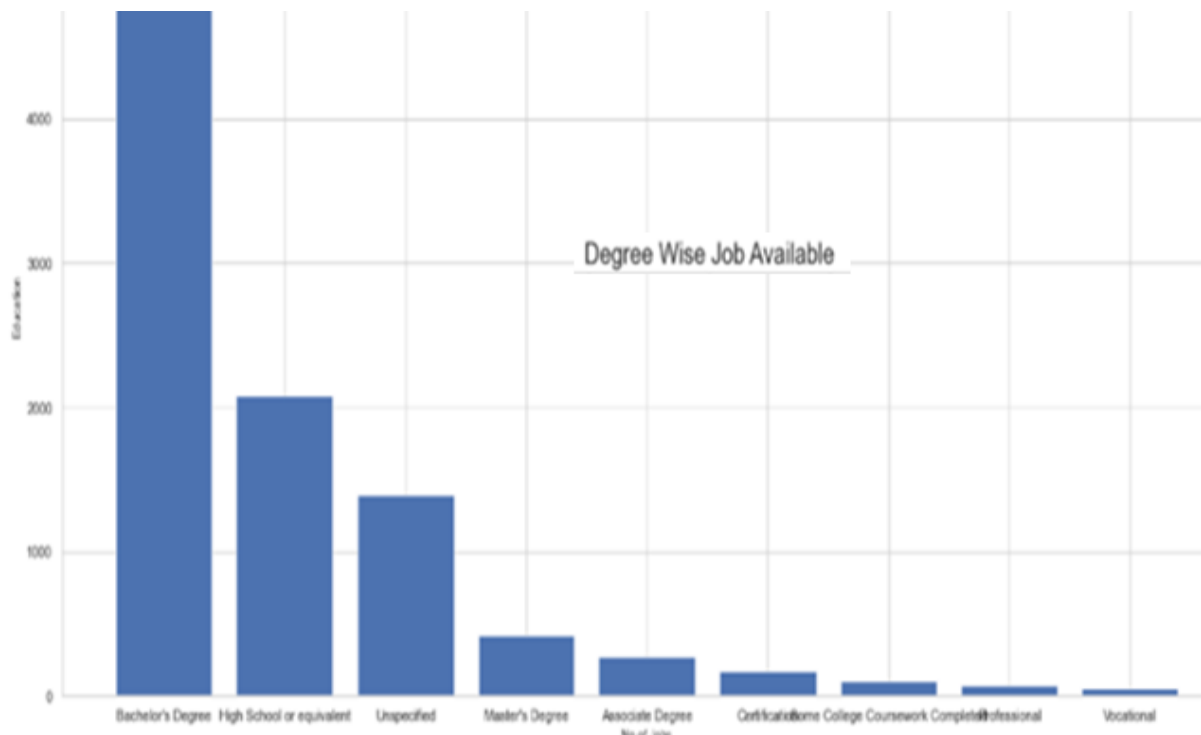

Fig 3 Country wise job posting
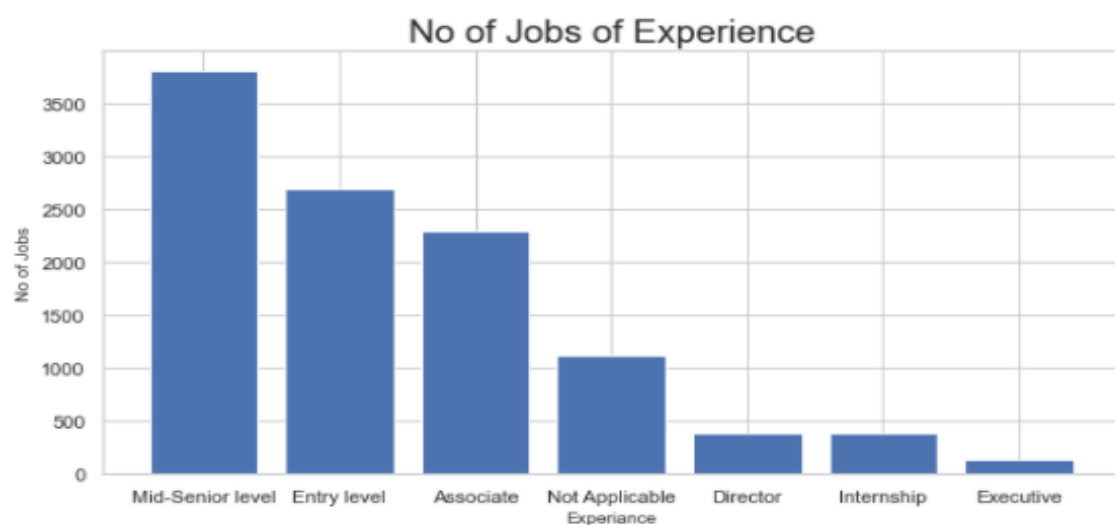
Fig 4 Degree wise job availability

Fig 5 No of Jobs as per experience

3.1.2 Feature Selection

When building a predictive model, feature extraction is the process of minimizing the number of input variables. It is essential to limit the number of input variables in order to lower the model's calculation costs and, in some situations, to increase the model's performance.

3.2 NLP Preprocessing

Natural language processing (NLP) is a collective term referring to the automatic processing of human languages. This includes both algorithms that take man-made text as input, and algorithms that produce text that looks natural as output.

3.2.1 Word Cloud

It is a visualization technique for text data to identify the stopping words and to extract the important word based on its frequency.

3.2.2 SpaCy

SpaCy is a free, open-source library for NLP in Python. It's written in Cython and is designed to build information extraction or natural language understanding systems. In this project we done feature extraction through Lemmatization process of grouping together the inflected forms of a word so they can be analyzed as a single item, identified by the word lemma, or dictionary form.Andtokenization used to break the sentence into separatewords or tokens.

3.3 Implementation of Classifier

We use Random Forest Classifier it is a meta estimator that fits a number of decision tree classifiers on various sub-samples of the dataset and uses averaging to improve the predictive accuracy and control over-fitting.

The purpose of randomness is to decrease the variance of the forest estimator. Indeed, individual decision trees typically exhibit high variance and tend to overfit.

The injected randomness in forests yield decision trees with somewhat decoupledprediction errors. By taking an average of those predictions, some errors can cancel out.
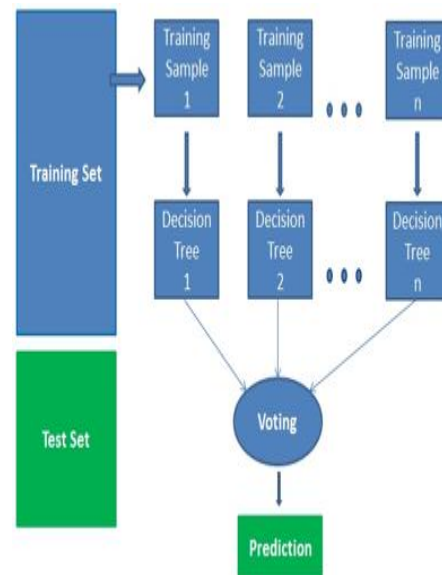

Fig 6 Random Forest classifier structure

Random forests achieve a reduced variance by combining diverse trees, sometimes at the cost of a slight increase in bias. In practice the variance reduction is often significant hence yielding an overall better model

4. Experimental Analysis

Above mentioned dataset is trained and tested to find fake job vacancies in a given database that contains both false and official posts. The following Table shows the Classification report of the prediction done through random forest algorithm. Precision(totalpositive) shows of 97 %. F1 score for real jobs is 0.99 and for fake job 0.58

```
Classification Report
              precision    recall  f1-score   support

           0       0.97      1.00      0.99      5104
           1       1.00      0.40      0.58       260

    accuracy                           0.97      5364
   macro avg       0.99      0.70      0.78      5364
weighted avg       0.97      0.97      0.97      5364
```

Fig 7 Classification report of Prediction

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Although this random Forest Classifier has obtained a F1-score that closely resembles other competitors, but this filter has shown significant performance in relation to other metrics.
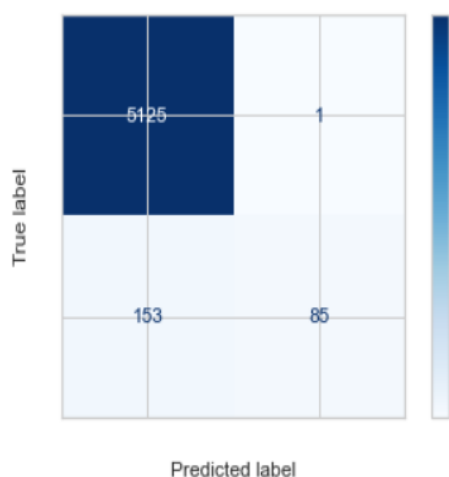

Fig 8 Confusion Matrix

5.Conclusion

Employment scam detection will guide job-seekers to get onlylegitimate offers from companies. For tackling employment scam detection, several machine learning algorithms are proposed as countermeasures in this paper. Supervised mechanism is used to exemplify the use of several classifiers for employment scam detection. Experimental results indicate that Random Forest classifier outperforms over its peer classification tool giving the accuracy of 97.1%.

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